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REPORT OF CHIEF OF BUREAU OF BIOLOGICAL SURVEY.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF BIOLOGICAL SURVEY,
Washington, D. C., August 29, 1918.

SIR: I have the honor to submit herewith a report on the work of the Bureau of Biological Survey for the fiscal year ended June 30, 1918.

Respectfully,

E. W. NELSON,
Chief of Bureau.

Hon. D. F. HOUSTON,
Secretary of Agriculture.

WORK OF THE BUREAU OF BIOLOGICAL SURVEY.

The work of the Bureau of Biological Survey is conducted along five principal lines: (1) Investigations of the food habits of North American birds and mammals in relation to agriculture, in charge of Dr. A. K. Fisher; (2) biological investigations with special reference to the geographical distribution of native animals and plants, in charge of E. W. Nelson; (3) supervision of national mammal and bird reservations, in charge of G. W. Field; (4) enforcement of the Lacey Act regulating the importation of birds and the interstate shipment of game, in charge of W. F. Bancroft; (5) administration of the Federal migratory bird law, in charge of George A. Lawyer.

ECONOMIC INVESTIGATIONS.

The direct relation of the field work of this bureau to the increased production and conservation of food, through the destruction of predatory animals and injurious rodents, has been thoroughly demonstrated during the year. In response to war conditions the general plans of noxious-animal control were promptly modified in order to obtain the most direct results in reducing losses of live stock due to predatory animals, and in protecting cereal and other crops from their rodent enemies, and stored food supplies and other property from contamination and destruction by house rats. During the year the increasing number of requests received by the bureau for cooperation in new areas and for an extension of operations in territory where control campaigns are already in progress showed the rapid growth of public appreciation of this work.

The need for controlling noxious mammals is evident in view of the fact that predatory animals destroy annually more than $20,000,000 worth of live stock, mainly on the western ranges; noxious

rodents destroy not less than $150,000,000 worth of food crops each year, and the losses through the depredations of house rats exceed a yearly total of more than $200,000,000.

The bureau had available during the year for noxious-animal control from its regular appropriations and from emergency funds about $445,000. State officials, organizations, and individuals expended in cooperative work, largely under the direct guidance of the Biological Survey, more than $400,000. The State council of defense of New Mexico allotted $25,000 from its war fund to be used to stimulate food production by cooperating with this bureau. An equal sum under similar conditions was appropriated in May by a special session of the Arizona State Legislature. Largely increased amounts for cooperative work next year are promised in many places. Appropriations of this character and large sums allotted for cooperation with the bureau by live-stock and farmers' organizations and individuals in the territory where work is being done are indications of its practical usefulness. In addition much material was contributed and many thousands of farmers and stockmen joined in the field work.

PREDATORY ANIMALS AND RABIES.

During the year the bureau had available about $304,000 to be used in the destruction of wolves, coyotes, mountain lions, and other predatory stock-killing animals and for the suppression of rabies in wild animals. Rabies for some years has been widely prevalent in Washington, Oregon, California, Idaho, Nevada, and Utah. The general plan of organization for the predatory-animal and rabies work remains the same as during the preceding year. The Western States are divided into nine districts, each under an inspector, as follows: (1) Arizona-New Mexico, (2) California-Nevada, (3) Oregon-Washington, (4) Colorado, (5) Idaho, (6) Montana, (7) Utah, (8) Wyoming-South Dakota, (9) Texas.

Predatory animals are destroyed by a force of from 250 to 350 hunters under the direction of district inspectors. About one-fifth of these are paid from cooperative funds provided by the States or contributed by local organizations and individuals. The hunters are paid regular salaries and are permitted to receive no bounties. The skins of animals taken by Federal hunters become the property of the Government. The net proceeds already received for the skins taken during the year amount to $78,579.45, which has been turned into the Treasury. Skins remaining unsold will probably bring the entire receipts for pelts taken during the fiscal year to approximately $100,000.

Predatory animals are destroyed by trapping, shooting, den hunting during the breeding season, and poisoning. Poisoning campaigns were conducted on a larger scale than ever before and the results have been so satisfactory that they have received the strong support of cattle and sheep owners. Stockmen report that in the regions where poisoning campaigns have been conducted the usual severe losses from predatory animals during the lambing season have been materially reduced and, in many cases, practically eliminated. The largest poisoning operation in the West was carried on in the great sheep-growing region of southwestern Wyoming, where it covered

about one-sixth of the State. Another large area in southern Colorado was systematically poisoned with excellent effect. The experience gained in these operations indicates that with the full cooperation of local stockmen poisoning will prove a very important factor in disposing of the predatory-animal pest.

The following predatory animals were taken by hunters under the direction of this bureau, during the present year: 849 wolves, 26,241 coyotes, 85 mountain lions, 3,432 bobcats, 30 lynxes, and 41 bears. Every effort is being made to have the predatory-animal hunters kill only such bears as are known to be destructive to live stock. A small number of bears, however, unavoidably fall victim to traps set for other animals.

Since the bureau began its operations against predatory animals the skins of 70,732 have been taken and a vast number in addition have been killed by poison. Reports from various sections of the country where poisoning operations have been conducted show the finding of thousands of dead coyotes. The well-known fact that the great majority of poisoned animals are never found, coupled with the scarcity of coyotes in the poisoned areas, indicates the effectiveness of the work.

The control of rabies in the regions affected is under the supervision of the inspectors in charge of the regular predatory-animal work. Field reports indicate a continuance of this disease among wild animals, but show that the work of the bureau has been effective in limiting its spread and in suppressing it in many places. Although the disease occurs over a vast territory, the results of the work give promise of its eventual suppression without, as was at one time feared, its spreading over the entire Rocky Mountain region.

As an indication of the losses due to predatory animals it may be stated that the chairman of the State Live Stock Board of Utah estimates an annual loss in that region amounting to 500,000 sheep and 4,000,000 pounds of wool. The president of the New Mexico College of Agriculture, as a result of a survey of conditions in that State, estimates an annual loss there of 3 per cent of the cattle, or 34,000 head, and 165,000 sheep. A single wolf killed by one of the bureau hunters in southern New Mexico was reported by stock owners of that vicinity to have killed during the preceding six months 150 head of cattle valued at not less than $5,000. In July, 1917, two male wolves were killed in Wyoming which in May had destroyed 150 sheep and 7 colts. Another pair of wolves killed near Opal, Wyo., were reported to have killed about $4,000 worth of stock a year. Another Wyoming wolf, trapped in June, 1918, had killed 30 cattle during the spring. Exceptionally skillful hunters and trappers are detailed to capture these especially destructive animals as rapidly as they are reported, and the success in capturing them has resulted in a great addition to the meat output of the ranges.

RODENT CONTROL.

Injurious rodents, as prairie-dogs, ground squirrels, jack rabbits, and pocket gophers, mainly west of the Mississippi River, are in the aggregate enormously destructive to cultivated crops and native forage, thus directly reducing the food output from farms and lessening the carrying capacity of the range for live stock. The control

of noxious rodents, except on the public domain, is effected through cooperation with the States Relations Service of the Department of Agriculture and the extension service of State agricultural colleges. Cooperative campaigns of this kind are being conducted in North Dakota, Montana, Idaho, Washington, Oregon, Wyoming, Utah, Colorado, New Mexico, Arizona, and Virginia. This cooperation has proved to be extremely successful, as is shown by the increased number of farmers who join in the work each season. In addition to the rodent pests which abound in the more arid States of the West, several species are very destructive to certain crops and orchard trees throughout the East, where demonstration work for their control has given good results.

In order to secure accurate data as to the destruction of forage by rodents on the open range, field trial plots have been inclosed for the purpose in cooperation with the Forest Service and the Carnegie Institution of Washington. It is already apparent that important results will be secured from this investigation.

PRAIRIE-DOGS.

Measures for the destruction of prairie-dogs have been conducted by field parties operating on Government lands and by cooperative work with farmers and stockmen through the agricultural college extension services in New Mexico, Arizona, Colorado, Utah, Wyoming, Montana, and North Dakota. In all these States the campaigns have been under cooperative agreements with the State extension services, and in New Mexico the State Council of Defense has joined in the work and contributed funds to extend its scope. Farmers and stockmen are taking the greatest interest in the work as a direct method of saving crops and forage.

As an illustration of the effectiveness and economy of the methods of destroying these pests, a badly infested plot of 320 acres was chosen for a demonstration in northern Arizona. One man spent a day distributing poison over this area, at a total cost for labor and material of $9.79. The following day 1,641 dead prairie-dogs were picked up from this tract. With the number which must have died in their holes, there can be little question that more than 2,000 prairie-dogs were destroyed in this experiment.

More than 3,500,000 acres of Government land have been practically freed from these pests.

GROUND SQUIRRELS.

Various species of ground squirrels extremely destructive to crops occur in enormous numbers over a large part of many of the Western States. The bureau has been engaged in a campaign for their control in cooperation with the State extension services in North Dakota, Montana, Idaho, and Wyoming; and introductory demonstrations leading toward similar campaigns have been made in several others of the cereal-producing States. In California there is also being conducted a campaign against these pests, with the State and county commissioners of horticulture and some county farm advisers cooperating.

The poisoned grain used in the campaigns to destroy ground squirrels on private lands is prepared under the supervision of field

representatives of the Bureau, and provided to the cooperators at cost by the local organizations. Many hundreds of tons of poisoned grain have thus been distributed on their lands by cooperating farmers. In the States of Montana, North Dakota, and Idaho alone, more than 50,000 farmers have taken part in the campaign and have provided more than $100,000 to procure poison supplies for the purpose. Farmers in these States have also contributed labor to distribute poison upon several hundred thousand acres of Government lands adjacent to the farmed areas, in order to prevent reinfestation of their lands. This work has resulted in the practical elimination of these pests over many millions of acres, and is adding materially to the grain output in all the States where work is being conducted.

RABBITS.

The continued depredations of jack rabbits upon wheat, barley, oats, beans, alfalfa, and other growing crops and upon stacked hay has necessitated active measures for their control in many of the Western States. Wherever a market was available and conditions were favorable the campaign for the destruction of jack rabbits was directed to killing these animals by drives and trapping in order that the meat might become available for food. One small community in this way shipped over 20,000 rabbits to California markets. This feature is being developed to a more extensive utilization of the palatable meat of these animals, by systematizing their capture and marketing. In places where it was impracticable to kill them for market, poisoning operations for their destruction were conducted.

The bureau has also assisted orchardists and truck farmers, especially in the Eastern States, by advice and demonstrations concerning the means for protecting themselves from losses by cottontail rabbits.

POCKET GOPHERS.

Field parties operated on a part of the Uinta National Forest, Utah, and the Nebraska National Forest, Nebr., during the latter part of the summer, killing pocket gophers, which were abundant and destructive over valuable grazing lands. They are also extremely destructive to alfalfa fields and orchards, and to various crops. Demonstrations have been given in many places to farmers as to effective and economical methods for killing them.

NATIVE MICE AND WOOD RATS.

In cooperation with the extension service of the Virginia Agricultural College, an educational campaign was undertaken among orchardists of the State to enable them to control the serious damage caused by pine mice. Demonstrations were given in many localities throughout the infested area. Wherever the methods of the bureau were carefully carried out, orchards were effectually protected and heavy losses from these small pests were prevented. Similar assistance was also rendered in several other States which reported damage from pine, meadow, and deer mice, and from wood rats.

HOUSE RATS AND MICE.

A nation-wide educational campaign was begun, to acquaint the public with the serious drain upon the national food resources caused

by house rats and mice and the menace to health due to their presence. From data recently assembled it is estimated that the losses occasioned by house rats exceed $200,000,000 annually in the United States.

Through bulletins, posters, magazines, and other avenues of the press, facts regarding the nature and extent of losses, and simple but effectual methods of protecting buildings, poultry, and other property from their depredations, were widely published. Demonstrations were given of methods of poisoning and trapping the animals, and plans for community organization were presented and discussed. As a result of this publicity, extended State campaigns have been undertaken in Alabama, Georgia, and Mississippi, and other States are preparing to join in the work. In addition, many local campaigns were organized.

In order to control the rat pest in the trenches and about the great Army stores one of the experts of the bureau was commissioned in the Sanitary Corps and sent to France in the spring to take charge of this work.

MOUNTAIN BEAVERS.

Investigations have been conducted to complete the study of the habits of the mountain beaver, or sewellel, a rodent living in the humid region of the northwest coast. With the development of agriculture it is becoming seriously injurious to crops, particularly to small fruits and market products. Demonstrations have been made in various localities for the control of these pests.

MOLES.

Following the demonstrations by the bureau of the market possibilities of skins of the large Townsend mole, which is extremely abundant in the northwestern coast region, the demand for its fur has steadily increased and the prices for prime skins have advanced accordingly. This animal has been a serious farm pest in western Washington, Oregon, and northern California. Successful methods of trapping it have been devised by the bureau and have been demonstrated by its representatives cooperating with the State extension services and agricultural agencies in Oregon and Washington. Great interest is being shown in the development of measures for the control of these animals, and successful boys' and girls' mole clubs have been organized. As a result many thousands of these animals have been killed and their skins marketed at prices which afford a fair profit for the work, thus paying for the cost of ridding lands of a pest.

DOMESTIC RABBITS.

The Belgian hare, or domestic rabbit, as it is commonly known, has long been a prolific producer of meat and fur in France, Belgium, Holland, England, and other parts of Europe. Under ordinary conditions the rearing of domestic rabbits for home consumption and market will give a quick and economical supply of meat, and at the same time produce fur of much value for making garments and for other manufactures. Much interest has been aroused by bulletins and other publicity matter to encourage the growing of these animals

on farms and in back yards. Boys' and girls' clubs have joined in the movement, and the number of rabbit growers in the country is rapidly increasing.

FUR-BEARING ANIMALS.

Studies of the adaptability of native fur-bearers to domestication have been continued at the Experimental Fur Farm, in Essex County, N. Y. The animals studied comprise blue foxes, minks, martens, fishers, and skunks.

Valuable results have been secured from the experiments relative to the feeding, housing, and general management of these animals. Suitable inclosures have been erected for the animals and equipment provided for preparing and preserving food.

In addition to investigational work at the Experimental Fur Farm, close touch has been maintained with fur breeders and all phases of the fur industry, from the care of animals to methods of dressing, dyeing, cleaning, and storing furs, in order to make this information available to the interested public. Investigations have been made of the basic structure and quality of various furs and of parasites and diseases affecting fur-bearers under domestication.

ECONOMIC ORNITHOLOGY.

The leading activities in economic ornithology have had to do with more or less destructive species of birds and with special cases of bird damage. Owing chiefly to the bureau's investigations of many years, the economic value of most of our native birds has been proved and recognized by protective legislation, until protection of species has advanced to a high degree and the birds have increased in numbers. In a few instances this increase has brought about changes in their economic relations and has resulted in damage to crops. It will be possible, however, under the terms of the migratory bird treaty act, to take steps for the control of certain species that at times become injurious. Similar action will be possible under State laws for certain other species. Bird protection in the United States, though entering upon a new phase, will, in general, be even more thorough than in the past, but at the same time special effort will be made to eliminate losses due to bird depredations, whether sporadic or otherwise.

FISH-EATING BIRDS IN RELATION TO THE NATIONAL FOOD SUPPLY.

At various times in the past, but especially since the United States entered the world war, fishermen have claimed that fish-eating birds greatly reduce an important national food supply, and therefore should be denied protection. To ascertain the facts the bureau has undertaken a comprehensive investigation of the whole problem. Studies are being made of the feeding habits of birds on the bird reservations, and all of the stomachs of fish-eating birds in possession of the bureau have been examined, as well as important collections loaned by the museums of the University of Michigan and the Canadian Geological Survey. Field investigations have been undertaken and will be continued to determine the habits of several

species under controversy. Results so far indicate that the proportion of commercial food fishes taken by most species of fish-eating birds is small.

DAMAGE TO RICE BY WILD DUCKS AND BLACKBIRDS.

Owing to a delay in the harvesting of rice in Arkansas in the fall of 1917, caused by unfavorable labor and weather conditions, the crop was subjected to the depredations of large numbers of wild ducks. The loss suffered by a single owner amounted to $12,000. This was an extreme case, but a bureau investigator found that serious damage occurred very generally in the region of Stuttgart and DeWitt. The case under consideration is the first reported that has been of real importance in this region and it is thought that recurrence can be avoided by making special efforts to harvest the rice before the arrival of large numbers of ducks.

Blackbirds are complained of in Arkansas, Texas, and many other States because they feed upon grain newly sown, in the milk, and in the shock. In the aggregate far more damage is done by blackbirds than by the wild ducks. Destruction of grain, including rice, by blackbirds is exceedingly difficult to control. The bureau has sought in the past to find useful protective methods and will continue investigations and experiments to find practical means to decrease such losses.

DAMAGE TO DUCK-FEEDING GROUNDS BY SWANS.

Some damage to the feeding places of waterfowl about ducking-club holdings in Currituck Sound, N. C., and Back Bay, Va., has been done by swans, because of the increase in the numbers and especially in the tameness of these birds. Their increase has been due to the continuous protection they have received for a term of years. The birds are very wary. Under the migratory bird treaty act, their depredations can be controlled in places where it becomes necessary.

THE CROW AND THE STARLING.

A report on "The Crow in Relation to Man," has been published. Besides going into considerable detail regarding the many-sided problem of the crow, this bulletin gives suggestions for the control of these birds, which have become extremely destructive in some States.

Material for a similar report dealing with the European starling has been collected. Extensive field observations and the laboratory analysis of over 2,600 stomachs have furnished accurate information regarding the food habits of the starling in this country, and its influence on agriculture. Heretofore prejudice and the exaggeration of local grievances have been the cause of many erroneous impressions regarding the bird. The starling was found to be one of the most effective bird enemies of ground insect pests in the Eastern States. On the other hand its attacks on cherries demand that farmers be permitted to take aggressive measures against it during the ripening season of that fruit.

ECONOMIC STATUS OF OTHER BIRDS.

Examination of bird stomachs by groups was continued to the extent permitted by other assignments of the staff, which has been re-

duced in numbers by draft and enlistment. Analyses were completed for the siskin, pipits, longspurs, and red-eyed vireo, and miscellaneous examinations made for a considerable variety of other birds.

Publications issued during the year, in addition to that on the crow, were a Department Bulletin, "Food Habits of the Swallows, a Family of Valuable Native Birds," and Farmers' Bulletins, "How to Attract Birds in the Middle Atlantic States," and "How to Attract Birds in the East Central States." Five Farmers' Bulletins were revised during the year.

BIOLOGICAL INVESTIGATIONS.

Biological investigations have been conducted during the year, both in field and in laboratory, along lines essential to the administration of the Bureau. The correlated activities which depend to a greater or less extent on these investigations include the administration of the Federal migratory bird law; the enforcement of the Lacey Act, which regulates importations of, and interstate commerce in, birds and mammals; the maintenance of mammal and bird reservations; the economic relations of birds and mammals to agriculture, stock raising, forestry, and the conservation of game.

Large additions have been made to the card indexes of data concerning the distribution, abundance, and habits of the various species of North American birds and mammals, including unpublished data gathered by field parties of the Bureau and miscellaneous manuscript records from outside sources, as well as a vast amount of information gathered from publications.

DISTRIBUTION AND MIGRATION OF BIRDS.

Reports on the migration of birds have been received from nearly 400 volunteer observers located throughout the United States and many parts of Canada and Alaska. Much additional information concerning the distribution and migration of birds was gathered from published sources. Indexed files containing these data consist of considerably more than a million cards. These files are of fundamental importance in connection with the administration of the Federal migratory bird law.

BIRD COUNTS.

Reports of the fourth annual series of local counts of breeding birds made in various parts of the United States were received from about 135 observers, many of whom reported on more than one area, bringing the total number of counts of nesting birds on selected areas to about 200. These schedules include many counts made on areas previously covered, affording opportunity for comparing conditions on the same area during succeeding years. In many cases a gratifying increase in bird population has been observed. Effort is being made to enlarge the list of volunteer observers and especially to secure reports from areas representative of the various physiographic types throughout the country.

BIOLOGICAL SURVEYS.

Field work continuing the biological surveys of States was conducted in Arizona, Florida, Montana, Washington, and Wisconsin, substantial progress being made in all these States. A report on the

life zones of Wyoming was published. A report on the mammals of Panama, the result of a biological survey of the Canal Zone carried on in 1911 and 1912 in cooperation with the Smithsonian Institution, is in press. Completed reports awaiting publication include lists of the birds of New Mexico, the mammals of New Mexico, the mammals of Wyoming, the birds of Texas, and the birds of Alabama. Arrangements are in progress for the publication of some of these reports by the States interested.

BREEDING GROUNDS OF MIGRATORY WILD FOWL.

An investigation of the breeding areas of migratory wild fowl in North Dakota, which was begun in June, 1917, was continued in July. After the close of this work a similar investigation was made of Swan Lake, Minn. A report covering the results of an examination of the latter area was published by the Minnesota Department of Fish and Game. During June, 1918, the investigation of the breeding grounds of wild fowl in central North Dakota was resumed.

GAME IN NATIONAL PARKS.

At the request of the National Park Service, Department of the Interior, an investigation of the distribution, abundance, and habits of the game and other mammals of the Yellowstone and Glacier National Parks was conducted between July 1 and October 1, 1917, in cooperation with the National Park Service. Preliminary reports containing briefly annotated lists of these two areas were published by the National Park Service in their educational literature during the year. More complete reports on both of these areas are being published by the Department of the Interior.

RELATION OF RODENTS TO FORAGE AND CROP PRODUCTION.

During the spring of 1918 field investigations were begun in Arizona, Colorado, Wyoming, and North Dakota to secure correct information concerning the damage to crops and forage by prairie-dogs, jack rabbits, and other rodents. Special quadrats, fenced and unfenced, were used where these pests occurred, to be kept under close observation and reported upon at the end of the season. The results have already shown that these investigations will yield data of much practical value, especially in connection with the effort to improve the forage production of the vast stock ranges of the West.

MAMMAL AND BIRD RESERVATIONS.

The Federal big-game and bird reservations in charge of this bureau remain, as heretofore, 74 in number. Four are big-game reservations; one—Niobrara—created as a bird reservation, is used for both birds and big game; and 69 are bird reservations.

On June 30, 1918, the big-game reservations contained a total of 301 bison, 212 elk, 51 antelope, and 15 deer. The health of the game on the reservations has been excellent and the increase good.

Efforts have been made by stock growers to secure use of the bison range near Dixon, Mont., for pasturing large numbers of cattle and horses. Such use of this or any other fenced game preserve would seriously jeopardize the health and even the existence of the

game and would appear permissible only under extraordinarily serious conditions, such as have not yet developed.

In maintaining the bird reservations the bureau has continued, as during previous years, to receive the generous and active assistance of the National Association of Audubon Societies. Owing to the claim that many of the birds protected on Federal bird reservations were large destroyers of useful food fishes, the secretary of that organization has worked in cooperation with the bureau in investigating the food habits of these birds, and has visited a large number of bird reservations for the purpose of securing information to be used in a cooperative report on them. From present indications this report undoubtedly will show that there is small basis for most of the assertions which have been made as to food-fish destruction by these birds.

MAMMAL RESERVATIONS.

Winter Elk Refuge, Jackson, Wyoming.—The elk came down from the mountains in their usual migration in the fall, but instead of halting among the foothills until near midwinter they proceeded in unprecedented numbers directly from the summer ranges to Jackson Hole Valley. Late in December many large herds had already collected on the refuge and in the adjacent country. Subsequent investigations showed that the foothill country ordinarily used by elk in autumn and early winter had been covered by an unusually early blanket of wet snow which had packed and become crusted until it was almost impossible for the elk to dig through to the forage. This was the reason for their early descent to the lower grounds.

During fall and early winter the weather was unusually mild, enabling the elk to obtain full benefit of the available pasturage. As a consequence, it was not necessary to begin feeding hay until February 7, three weeks later than usual. To prevent undue congestion, feeding was begun simultaneously at four points—two by the Federal warden in the refuge, and two by the State, one at Petersen's ranch to the north and the other at Leek's ranch to the south. Feeding was continued at these points until March 28, when the elk scattered in search of outside pasturage. Stormy weather during the first week of April brought many of the elk back to the feeding grounds, where feeding was resumed from April 5 to 8. The maximum number of elk at the feeding grounds at any one time was estimated to be about 10,000 head, of which about 2,500 were calves. Of the 560 tons of hay harvested on the refuge during the summer of 1917, about 440 tons were fed to the elk during the winter. The State game officials of Wyoming continued their elk-feeding operations begun in 1909 and fed about 450 tons of hay at the points named above.

The losses of elk about the various feeding grounds during the season aggregated 365 animals, of which 325 were calves. As usual, many starving calves came from the foothills to the feeding grounds in March, and a considerable number of them died. No accurate data are available concerning the losses on the winter ranges outside the refuge, but it is estimated they were far less than during the preceding year.

In order to lessen the losses on the refuge, a feeding corral containing 5 acres was constructed near the headquarters in the fall, mainly from material provided by State game officials, in order to

determine whether it was practicable to separate starving calves and weak elk from among the stronger animals in winter. Many were thus saved which otherwise would have been injured or trampled to death during the feeding operations. The experiment gave such gratifying results that still greater efforts will be made along the same lines the coming year.

As a result of a visit of representatives of the Biological Survey and of the Forest Service to the summer and winter ranges of the elk, additional lands, in the Teton Forest have been classified as chiefly valuable for elk grazing, and the grazing of cattle on certain parts of the winter range has been further restricted by regulations of the Forest Service. About 5½ miles of drift fence to hold additional winter grazing areas for elk is being constructed on public lands adjoining the refuge as rapidly as labor conditions will permit.

Additional farming equipment has been purchased and an effort is being made to bring the yield of forage on the refuge up to a maximum in order to provide a surplus for use during unusually severe seasons. Fifty-six acres were prepared and seeded to oats and grass during the spring of 1918, and 3½ miles of ditches and laterals for irrigation were constructed or enlarged. The work of improving the reservation will be continued as rapidly as available funds permit.

National Bison Range, Montana.—Owing to the mild winter with little snowfall, the game on this refuge came through in fine condition. By an increase of 45 calves, 6 of which were born in July and August, 1917, the bison herd was brought up to 239 head. No adult bison died during the year, but 3 premature births occurred. Contagious abortion is reported to exist among domestic cattle in that region and it is necessary that every precaution be taken to prevent the spread of this disease to the buffalo herd.

Repeated efforts have been made to secure the use of the bison range for the pasturage of cattle and horses on account of the shortage of forage on the range in that region. To permit this would clearly endanger the existence of the game on the refuge and completely nullify the object for which it was set aside. The presence in this region of the disease mentioned above is sufficient indication of what might occur should the bison range be temporarily devoted to the use of cattle.

In the spring there were 90 elk and 34 antelope on the range, but the number of young born is still unknown. Through the cooperation of the National Park Service a nucleus herd of 6 mule deer—2 yearling bucks, 1 yearling doe, and 3 older does—were transferred from the Yellowstone National Park. As mule deer are natives of this region there is every reason to expect that they will thrive on the range.

About 4 acres favorably located were seeded to buckwheat and other cereals to supply feed for sharp-tailed grouse, which are beginning again to nest on the reservation. Large numbers of ducks, especially mallards, haunt the shallows of the river flowing through the lower parts of the reserve.

Wind Cave National Game Preserve, South Dakota.—Including a calf born in August and 8 of the 9 calves born the present spring, buffalo on this preserve now number 42. One buffalo calf

was born prematurely, and a 15-year-old cow and calf of this season died during the year. The preserve contains 71 elk, with further returns to be obtained concerning the young born.

The antelope herd numbers 15, of which 5 are young born during the past spring. During the summer of 1917 there were 23 antelope on this preserve, but 13 of these were killed in the fall and winter by coyotes, which had gained access to the inclosure. The warden tried for some time to trap and poison these animals, but without success. Finally a Government predatory animal hunter was stationed on the preserve and caught 19 coyotes, most of them outside the fence. The holes under the fence through which the coyotes obtained access have been closed and every effort made to increase the coyote-proof character of the inclosure. Since 1913, when the preserve was stocked with big game, 34 coyotes have been caught in this vicinity, 14 of them inside the preserve fence. The increase of 5 fawns from the 10 surviving members of the herd is encouraging and extraordinary precautions will be taken to protect them during the coming winter.

A fire started by an electric storm broke out during July, but, with the help of rangers from the Harney Forest, was extinguished within two or three days without doing material damage. On June 23 a cloudburst and flood washed out the crossings and broke the fence in five places, each break being about 7 rods in width. Prompt repairs by the warden prevented the escape of any of the game animals.

During the last park season, visitors to Wind Cave numbered 16,742, many of the visitors coming solely to see the animals, a never-ending source of interest to the public.

Sullys Hill Game Preserve, North Dakota.—Early this fiscal year a 5-room frame cottage was completed, together with a frame barn, as headquarters for the resident warden. Warden service has been maintained throughout the year.

There are now on the preserve 14 elk and 5 deer in good condition. Negotiations have been continued to secure a small herd of bison for this preserve, but various difficulties have occurred from time to time to prevent this.

The preserve is a favorite picnic ground for several thousands of people who go there for an outing each summer. A small additional expenditure to increase the size of this preserve and to add some improvements would greatly increase its attractiveness and usefulness to the public.

Niobrara Reservation, Nebraska.—The bison herd on this reservation now numbers 21. There are 37 adult elk, but the number of calves born during the spring is still unknown. Two mule deer also are on the reservation, making a total of 60 big-game animals.

An additional pasture of 200 acres to accommodate the big game on the reservation has been inclosed by a substantial fence, the original 200-acre pasture being overstocked. Steps are also being taken toward the construction of several miles of fencing against cattle on the southern part of the reservation to allow a growth of better cover for encouraging the nesting of sharp-tailed and pinnated grouse.

BIRD RESERVATIONS.

The 69 Federal bird reservations continue to furnish attractive feeding, breeding, and resting places for many species of birds useful on account of their value either for food, as insect destroyers, or for their beauty. The value of well-chosen bird reservations as an asset to the country is becoming more and more appreciated. Among the most notable of the Federal reservations are those at Klamath and Malheur Lakes, in Oregon, and Big Lake, in Arkansas. As funds become available, it will be possible to develop some of these reservations and greatly increase their usefulness.

Steps have been taken by interested parties to drain the water from both the Klamath and Malheur reservations, to make the land available for agricultural use. The resulting gain is more than doubtful, while the loss would be a most serious one, not only to Oregon but also to the other Pacific Coast States, owing to the fact that these two bodies of water are the greatest inland breeding resorts for wild fowl remaining on the west coast. To destroy them would have a seriously detrimental effect on the future of the wild fowl of this region.

The continual progress of draining operations, whereby water is drawn from marshy tracts and shallow lakes and the land is devoted to agriculture, is rapidly cutting down the remaining feeding grounds for wild fowl. For this reason every effort should be made to retain a few specially desirable natural resorts for wild fowl in various parts of the country. Failure to do this will result in a decrease of our wild-fowl resources, which may occasion far more loss than the agricultural value from these tracts will offset.

In Florida, during the past year, a movement was on foot against the brown pelicans on the ground that they were destroying food fishes, and that for that reason during this time of national stress they should be killed. As a result of the agitation a night raid was made on the Pelican Island Reservation during the spring and about 400 young birds were wantonly killed. Investigation proved that the charges against the pelicans had little real basis in fact, since the fishes eaten by these birds are not of the species classed as food fishes.

An inspection of Passage Key Reservation, at the mouth of Tampa Bay, showed that this valuable bird resort is being rapidly cut away by sea currents. The erosion has reduced the island until during storms the sea is driven across most of it, and there is little doubt that within a comparatively short time it will be washed away. The size of East Timbalier Island also is being much reduced by erosion.

On the other Florida bird reservations visited, including those at Charlotte Harbor and the Indian Key Reservation, near the mouth of Tampa Bay, birds were nesting in large numbers and there was no evidence that they were being molested.

The rapid decrease in numbers of the sage hen, the largest and one of the most interesting of the North American grouse, appears to call for the establishment of preserves to safeguard it in several parts of its range, notably in eastern Oregon and possibly in Wyoming, Utah, or Nevada.

No warden service has been possible on the Hawaiian Islands Reservation, but from information received from time to time from

volunteer observers, apparently no further poaching has taken place on that remote bird breeding ground.

INTERSTATE COMMERCE IN GAME.

ILLEGAL SHIPMENTS.

For the enforcement of the Lacey Act, regulating interstate shipments of game, five inspectors were employed, each in charge of one of the five districts into which the country is divided; one of these resigned in May. As a result of the activities of the inspectors, coupled with the ready cooperation of State game officials, illegal shipments of game are rapidly lessening.

During the present year special attention has been given to the illegal shipment of quail in the Middle Western States, and 19 cases were reported for prosecution. Only 4 cases of the unlawful shipment of wild ducks were reported, the smallest number for any year since the passage of the Lacey Act. Special effort has also been made to stop illegal shipments of beaver skins from States having continuous closed seasons on these animals, and to suppress illegal shipments of skins of other fur-bearers.

Thirty-seven violations of the Lacey Act (secs. 242, 243, and 244 of the Penal Code of the United States) were reported to the solicitor during the year. Twenty-two cases were based on illegal interstate shipments of wild game, 10 on knowingly receiving such illegal shipments, and 5 on improper markings of shipments. Six additional cases, lacking only the necessary affidavits to complete them, are in course of preparation, making a total of 43 cases.

The traffic in violation of the Lacey Act included quail, prairie chickens, wild ducks, English pheasants, partridges (ruffed grouse), deer, squirrels, and beaver skins, violations taking place in the following States: Colorado (1), Illinois (10), Indiana (1), Kansas (1), Maine (2), Maryland (2), Massachusetts (2), Missouri (3), Montana (1), New Hampshire (1), New Jersey (3), North Dakota (1), Oregon (1), Pennsylvania (3), South Dakota (1), Tennessee (1), Utah (1), Virginia (1), and Washington (1).

Investigations of 25 violations of the Lacey Act in 13 States and the District of Columbia were not reported for prosecution for various reasons, as follows: Prosecutions already made and adequate fines imposed in State courts for shipping in violation of State laws; circumstances, financial and otherwise, of violator; innocent violation of law and mitigating circumstances in connection therewith; recommendations made by State and local game officials; and death of violator.

Thirty cases, including a few reported in previous fiscal years, were disposed of by the courts, resulting, in all but one case, in the imposition of fines ranging from $5 and costs to $200 and costs. The total amount of fines imposed was $2,873.

IMPORTATION OF BIRDS AND MAMMALS.

War conditions and the resulting restrictions on foreign shipping have had a marked effect on the importation of birds and mammals during the year. On February 14, 1918, the President issued a

proclamation requiring a license to import certain articles from foreign countries, and on March 23 the War Trade Board through its Bureau of Imports published a list of restricted imports, among which were live animals, except those to be used for scientific and breeding purposes. Under these conditions few shipments have been received from England, and importers have had to rely almost entirely on South America and the Orient for birds and mammals for exhibition and propagation. Notwithstanding the restrictions, importations from England have not ceased entirely, as shown by the arrival of several miscellaneous consignments during the first half of the fiscal year and one during the spring.

The number of permits issued during the year decreased 25 per cent, from 413 in 1917 to about 300 in 1918, and the number of inspections from 112 to 76. More than 25 per cent of the permits issued were for the entry of foxes from Canada, the total number entered under these authorizations being 391. Among the birds imported were 6,232 game birds, 10,000 canaries, and 51,302 other nongame birds. At Honolulu only 13 permits were issued, for the entry of 176 birds, chiefly pheasants. So far as known, no prohibited species were brought in during the year.

The total number of birds and mammals imported included 1,933 mammals, as compared with 4,135 in 1917, and 67,933 birds, as compared with 97,993 in 1917. The importation of game birds and canaries reached the lowest point since 1900. Nearly 85 per cent of the game birds were quail from Mexico, and of the 1,027 others only 150 were pheasants. The total number of canaries imported during the year was less than the average importation for a 10-day period in 1913, the year before the war, and the time of maximum entries. The canaries imported were partly English and partly Chinese; very few were German singers, which formerly made up a very large proportion of the shipments.

The shipments of miscellaneous nongame birds included a number of rare species and also species imported for the first time. Among the most important entries were a large consignment from Australia, a small but important shipment from South Africa, and several shipments from Colombia, Venezuela, and Brazil. Among the rarer birds of special interest may be mentioned: Two species of birds of paradise, including two specimens of the Count Raggi bird of paradise (*Paradisea raggiana*) and one lesser bird of paradise (*P. minor*), from New Guinea; two regent birds (*Sericulus chrysocephalus*); two tawny frogmouths (*Podargus strigoides*) from Australia; nearly 1,500 of the beautiful Lady Gould finch (*Poephila mirabilis* and *P. gouldiae*) from northwestern Australia; 155 little painted quail (*Excalfactoria lineata*) from the Philippines; and two white-crested touraco (*Turacus corythaix*) and two-horned guinea fowl (*Numida coronata*) from Africa. Many rare birds were imported from South America, including, among others, an imperial parrot (*Amazona imperialis*) and a Brazilian hawk-headed parrot (*Deroptyus accipitrinus fuscifrons*). Other importations of the year comprised an echidna, the first since 1913, and several mammals brought in for the first time, among which were a brown hyena from South Africa and several species of kangaroos from Australia.

IMPORTATION OF QUAIL FROM MEXICO.

The joint regulations governing the importation of quail from Mexico, issued by the Treasury Department and the Department of Agriculture under date of November 13, 1916, were in full force and effect the past season, the entry of quail being permitted from February 15 to April 10, inclusive, and on March 8, 1918, Laredo, Tex., was designated as a port of entry in addition to Eagle Pass, Tex., and New York City. Cooperation was continued with the Bureau of Animal Industry in having a thorough inspection of the birds made during the ten days' quarantine.

The first permit was issued February 20 and the last, April 4. The number of quail for which permits were issued was 10,500, and the number released from quarantine only 5,205, as compared with permits issued for 42,973, and the release of 32,814 in 1917.

The notably large decrease in the number of quail actually imported during the past year is accounted for by the scarcity of birds in northern Mexico due to drought, and the refusal of large ranch owners to permit the trapping of quail on property owned and controlled by them. Also it is evident that State game officials were reluctant the past year to purchase Mexican quail for propagation because of the severe losses of birds imported during the season of 1917.

Of the 5,205 birds actually released from quarantine only 16 were found dead during the 10-days' quarantine period, and no case of quail disease was discovered. So far as reports received by the department indicate, there were few losses of birds in shipping. The change of dates for the importation of Mexican quail—beginning at a later period, February 15, instead of in the fall, as in 1916—has proved beneficial by preventing the birds from reaching the northern States during severe winter weather.

INFORMATION CONCERNING GAME LAWS.

The regular annual publications, including a directory of officials and organizations concerned with the protection of birds and game, the eighteenth annual summary of game laws (prepared on a different plan from those heretofore issued), a general poster showing open seasons for game in the United States and Canada, and a local poster showing open seasons for North Carolina, where many local laws apply to particular counties, were issued and widely distributed. State game laws have been carded and indexed as fast as received, memoranda of the more important changes being specially noted.

FEDERAL MIGRATORY BIRD LAW.

Owing to the prevention of spring shooting during the last few years, under the Federal migratory bird law, a great increase in migratory wild fowl has been reported throughout practically the entire United States. The reports state that more birds were killed during the fall of 1917 than in any similar season for many years. With the need of increasing food resources, this increase in game

birds, as a result of a Federal conservation law, was a practical and opportune return. Continued protection of our wild fowl during the spring will unquestionably continue to increase the returns in food and sport from this source each year.

For administrative purposes under the migratory bird law the United States is divided into 13 districts, under the supervision of 12 inspectors, who, with the assistance of 182 Federal wardens, enforce the regulations in the various States. During the year the commissions of 47 Federal wardens were terminated and 49 new wardens were appointed.

The inspectors and Federal wardens reported 313 violations of the regulations, which with those of previous years make a total of 1,132 cases on file. All but 29 of these cases, which have been disposed of in court, have been withheld pending the decision of the United States Supreme Court in the case of the United States *v.* Shauver, involving the constitutionality of the law. Defects in the law, particularly in that it did not make the possession of birds during the closed season unlawful, and did not confer on inspectors and wardens the power of arrest and search, made it possible for many violators to escape. A further difficulty in enforcement was encountered in the limited number of inspectors, each with an unduly large district. Reports, however, show that violations were more sporadic and fewer birds were killed unlawfully than in previous years.

Voluminous information has been received from State game commissions and others showing that there is an ever-increasing number of waterfowl and shorebirds in most of the States; furthermore, that wild fowl have become unusually tame in spring because they are not molested at that season; and that many thousands are breeding in localities where they had not nested for many years.

The consensus of opinion attributes these greatly improved conditions to the general observance of the Federal prohibition against spring shooting which has been brought about through the good will of sportsmen and by the increased activities of this bureau, with closer cooperation of State game authorities.

The friendly attitude of the State game commissions toward the Federal migratory bird law has been shown in many ways, particularly in their initiative whereby the State and Federal regulations have been brought into harmony. Twenty-three States now have laws making the open seasons on migratory wild fowl similar to those under the Federal regulations. Amendments of the regulations were promulgated October 15, 1917, which assisted in unifying Federal and State game laws, thus simplifying their administration.

A bill to give effect to the treaty between the United States and Great Britain for the protection of birds which migrate between this country and Canada passed the Senate July 30, 1917. The Senate bill, with amendments, passed the House June 6, 1918, and was then referred to a conference committee. The conference report was adopted by the House June 28, and by the Senate June 29, and the bill was signed by the President and became effective July 3, 1918.

Nation-wide interest was manifested in the passage of this legislation, which was secured through the united efforts of State game commissions, sportsmen, farmers, and others interested in the conservation of wild life. The new law contains many excellent provisions necessary for its effective enforcement, and it will be possible to obtain much more satisfactory results under it than have been possible under the original migratory bird law. Canada has already passed an enabling act and promulgated regulations for enforcing the terms of the treaty.